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17. ABSTRACT (MAX. 250 WORDS) Teaching machines, computers, and appropriate building designs and facilities in higher education institutions are presented. The PLATO program (Programed Logic for Automatic Teaching Operation) allows 1,000 students to simultaneously study eight different lessons. Each of the students is plugged into the mother computer and has a dialogue with the computer through two sets of electronic keys: one to answer questions; and one to tell the machine to continue, reverse, or judge his answer. The GASP programs (General Academic Simulation Programs) make up entire course schedules. Teaching machines, films, recorders, and automated libraries are additional media that allow students to proceed at their own pace and according to their own interests.

The CENESYS program (Graduate Engineering Education System)is one of the newest television networks. It is designed to offer graduate courses to engineers. The telerama "system" is designed to fill individual need; it is housed in an auditorium wired for television and other audial devices. Built into an arm rest of each seat in the auditorium is a multiple-choice responder unit whereby the student reacts to what he is being taught. Multiple option television eliminates the necessity for a large technical staff. The instructor has two vidicon cameras, one facing him and one overhead, which he controls himself while presenting his material. Comput r-controlled libraries handle book indexing, check-outs, returns, circulation control, and catalog listing. New buildings wired for sight and sound are the operation grounds for these experiments.

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# NO. 4—Teaching Machines, Computers, TV in Our Changing Colleges

ED002266

*Have the nation's colleges gone "hardware happy" in trying to find new ways of teaching their students? Not necessarily, if they use such hardware in conjunction with good teachers. In this, the fourth of a six-part series on the crisis of change in our colleges, Education Editor Terry Ferrer introduces some of the new hardware and housing in higher education, with a professional assist from Dr. Samuel Baskin, editor of the forthcoming McGraw-Hill book, "Higher Education: Some Newer Developments."*

There are 1,000 students, each plugged into the mother computer. They are studying eight different lessons. Each of the students is having a "dialogue" with the computer through two sets of electronic keys, one to answer questions and one to tell the machine to "continue," "reverse," or "judge" his answer. The student watches his individual television screen. On it appear both slides operated by the computer and machine-drawn characters and diagrams on the electronic blackboard.

Is the student in trouble? He pushes the "help" button, which takes him out of the mainstream of the lesson to a help sequence. Does he get the picture now? He presses the "aha" button and back he goes to the lesson sequence. Is he still unable to get the electronic message after "help"? He then may summon "help-help"—which comes not in the form of a professor but more machine aid. If all else fails, the computer—which hasn't been very busy anyway since all 1,000 students require only a third of its time—will just give him the correct answer.

1984? No, it is the PLATO program of the University of Illinois, under development for three years. Later this month, PLATO—which stands for Programmed Logic for Automatic Teaching Operation—will begin to teach Illinois students. It is the most sophisticated computer system for such an operation ever devised.

PLATO has a cousin called GASP (General Academic Simulation Programs) which the Massachusetts Institute of Technology is now using to make up its entire course schedule, and courses at neighboring Nasson College. GASP has already completed four large high-school schedules, including that of the new Pascack Hills High School in Montvale, N. J.

These are only two of the massive pieces of hardware that are revolutionizing the teaching process for this college generation and for those of the future. More than 300,000 courses stream out of commercial and educational television sets, many of them carrying credit in the country's colleges. Less complicated teaching machines, films that thread and rewind automatically, lecture playbacks by audiotape or video tape, new multiple-screens for slides, drawings and TV simultaneously in auditoriums, libraries which are automated to find an obscure quote in microseconds rather than hours—all these are bringing the world into the college classroom. At the same time, they are freeing the student to proceed at his own pace and according to his own interest, as well as giving him immediate answers to his learning problems.

And new buildings totally wired for sight and sound

A Stephens College laboratory with a peek-through window and the latest electronic aids, including TV.

J0275

are the operation grounds for these experiments.

One of the newest television networks will not even get going until Dec. 21. This is the new "talk-back" Florida TV system known as GENESYS (like all such systems now, that is an acronym too, standing for Graduate Engineering Education System.) Designed to offer graduate courses to degree-seeking young engineers who have flocked to such Florida installations as Cape Kennedy, GENESYS will link Orlando, the Cape, Daytona Beach, Melbourne and the University of Florida at Gainesville. Instruction, 70 per cent of it live, will be furnished by 16 professors, of whom the students can ask questions through a talk-back plug-in. Geared to low enrollments in specialized engineering work, GENESYS will cover a 200-mile area at the flip of a TV switch.

Also designed to fill to individual need is the "telemation system" at Chicago Teachers College. Its auditorium is wired for TV and every other audial device, and built into an arm rest of each seat is a multiple-choice "responder" unit whereby the student reacts to what he is being taught. Chicago too has its own TV College, Chicago Junior College, which in three years gave course credit to more than 25,000 viewers. And Pennsylvania State teaches some 30 of its courses, in whole or in part, by TV.

And at the United States Air Force Academy in Colorado Springs, "multiple option" television obviates the necessity for a large technical staff. The instructor has two vidicon cameras, one facing him and one overhead, which he controls himself while presenting his material. The academy also has a Big Brother set-up permitting the TV monitoring of several classrooms from a central office.

TV is also featured in the new Phiysical Sciences Lecture Hall at the University of California at Berkeley. A huge rotating stage designed by Dr. Harvey E. White, professor of physics, has three "fronts". If the front facing the 550 seats is being used to teach biology, professors may be preparing a chemistry experiment and a physics experiment on the two fronts backstage. As the first class ends, the stage slowly rotates (so as not to disturb the experiments) and a virtual new classroom is in place.

Two zoom TV cameras focus in on the experiment in process, and 16 TV receivers permit those in the back and at the sides of the tiered auditorium to see. Because of the rapid changeover, the hall is now handling 5,000 students a week in its first year of operation.

If TV is changing the classroom, the computer is totally revamping the library. The new Florida Atlantic University, the talk of the academic world, has the country's first computer-controlled library. The computer handles book indexing, check-outs, returns and circulation control; it also produces a catalogue listing and a daily circulation list. Through the use of individual plastic identification cards and an IBM data collection system, all book borrowing is immediately recorded—as is the due date.

The Johns Hopkins University last month dedicated a new library which will also be centrally controlled by a computer, and Northwestern University has one in the planning stage.

One of the principal protagonists of the new hardware and housing is Dr. Lewis B. Mayhew, professor of education at Stanford. Unless the new experiments are pushed forward and followed through, he warns, higher education will plod along leaving "undisturbed the slow waltz of lecturing, testing and grading." He sums up his views in "New Media in Higher Education," a 182-page book published by the Association for Higher Education of the National Educational Association.

But if the colleges follow through, Dr. Mayhew predicts, "the new media portend a revolutionary future for the practice of education. Each campus will have a learning resources center in which knowledge in its manifold forms will be ready for immediate recall and transmission to all who seek it.

"If a teacher wants to make a point through the voice of Winston Churchill," Dr. Mayhew continues, "the push of a button will bring his voice from the electronically catalogued archives of the learning center. At the same time the center would be playing music, conducting exercises in French, reproducing an outstanding lecture, and showing—via an electrical impulse—a rare book lodged in a university collection half a continent away."

# *For Learning—a Center Of Electronic Hardware*

"Facts from things and values from people."

Dr. Harold B Gores, president of Educational Facilities Laboratories, the Ford-founded nonprofit organization that helps schools and colleges with their physical problems, was pinpointing the theory behind the new hardware which is invading the nation's colleges.

Most comprehensive of this hardware is the "learning resources center," combining television, film, slides, recordings, tapes, overhead projectors, radio and just about every electronic device conceived of by the modern engineer.

And the most comprehensive of the centers supported by $77,500 in EFL grants, is the James Madison Wood Quadrangle of Stephens College, dedicated just two months ago.

Stephens, an 1,800-student women's college in Columbia, Mo., had already done pioneering work in telephone lectures, which bring renowned scholars into the classroom for two-way conversations with the students. The Wood Quadrangle goes far beyond the telephone.

In its library, a Stephens girl may check out records, films, filmstrips, programmed-instruction material, slides and audiotapes, as well as any of 75,000 books, and use them at her individual study carrel. Slide projectors, miniature television sets and motion picture machines are all available, as well as earphones or larger stereophonic playback rooms.

Or, in the communications center, the Stephens student may use one of the two large television studios (or watch them in operation), or one of the two radio studios (AM and FM), or produce her own film or develop her still pictures.

In a typical classroom, her teacher will have at fingertip touch an electronic console control operating a record player, an audiotape recorder and a three-cue projector. There will also be an overhead projector for broad view of small work done on a piece of paper. The two auditoriums bristle with the same kind of equipment. There are art galleries and studios. Learning laboratories are also available for foreign-language teaching by the audio-lingual method.

And even the dormitories receive closed-circuit television. Under the Stephens plan, some 100 first-year students take all five of their required general-education courses in their dormitories. Lounges double as classrooms to bring a sense of intimacy and small-group organization to the girls. Faculty members have their offices in the residence hall, grouped around a conference room.

Stephens is not "hardware happy," says Dr. Gores. Through its combined use of electronic gadgetry and teachers close at hand, he maintains, the college now has "the most sensitive adaptation of the best we know at the moment, along with preparations for embracing with least cost and greatest ease what seems likely to come next."